REMARKS

The Office Action of February 24, 2009 was received and carefully reviewed. Claims 36-68 were pending prior to the instant amendment. By this amendment, claims 36-37, 40-47, 49, 54-57, 60-61, 63-64, and 66 are amended. Consequently, claims 36-68 are currently pending in the instant application. Reconsideration and withdrawal of the currently pending rejections are requested for the reasons advanced in detail below.

Claims 36-68 were rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement. Claims 36-68 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. The claims have been amended from the previous "*means for*" language to recite specific structural features. For example, the previous term "*means for applying ultrasonic energy to fluid within the passage*" has been amended to "*operating devices for applying ultrasonic energy to fluid within the passage.*" Basis for this amendment can be found, at least, for example, on page 11, lines 10 and 22 of the specification as filed, where item 12 of the figures is firstly referred to as "*means for applying ultrasonic energy 12*" and then as "*operating devices 12.*" Therefore, it is clear that the "*operating devices 12*" are the means for applying ultrasonic energy. Consequently, it is believed the above amendment overcomes the Examiner's objection under *35 USC § 112* as the amended claims clearly and distinctly point out the operating devices which are used to apply ultrasonic energy and are clearly supported by the filed specification.

Claims 36, 37, 40, 46, 47, 66 and 68 were rejected under 35 U.S.C. §102(b) as being anticipated by Boucher (U.S. Patent No. 3,672,823). Claims 36, 41, 55-58 and 64 were rejected under 35 U.S.C. §102(b) as being anticipated by Kelly (WO 00/58224). Boucher and Kelly, however, fail to render the claimed invention unpatentable. Each of the independent claims have been amended to recite a specific combination of features that distinguishes the invention from the prior art in different ways. For example, independent claim 36 recites a combination that includes, among other things:

> *"[f]luid processing apparatus for use in an elongate passage, the apparatus comprising a plurality of operating devices for applying ultrasonic energy to fluid within the passage, wherein said operating devices are provided at different axial positions along the elongate passage and wherein axially adjacent operating devices are radially non-parallel and radially non-opposing."*

Independent claim 57 recites yet another combination that includes, inter alia,

> *"[f]luid processing apparatus for use in an elongate passage, the apparatus comprising an operating device for applying ultrasonic energy to fluid within the passage, said operating device comprising an extender element for projecting an operating member into said elongate passage, said apparatus further comprising flushing means for directing cleaning media for flushing detritus from said extender element."*

Additionally, independent claim 64 recites another combination that includes, for example,

> *"[f]luid processing apparatus for use in an elongate passage, the apparatus comprising an operating device for applying ultrasonic energy to fluid within the passage, said apparatus further comprising flushing means for flushing detritus from said apparatus, said flushing means comprising a flushing nozzle for directing flushing media towards an outer surface of a substantially conical surface provided within the passage."*

Also, independent claim 66 recites yet another combination that includes, for example,

> *"[a] method of treating fluids comprising placing a fluid processing apparatus into an elongate passage, and passing the fluid through the elongate passage . . . wherein said fluid processing apparatus includes a plurality of operating devices for applying ultrasonic energy to fluid within the passage provided at different axial positions along the elongate passage, axially adjacent operating devices being radially non-parallel and radially non-opposing."*

At the very least, Boucher and Kelly fail to disclose or suggest any of these exemplary features recited in the independent claims 36, 57, 64, and 66.

The claimed invention relates to fluid processing apparatus which comprise a plurality of operating devices axially spaced along an elongate passage. When fluid passes along the elongate passage, the operating devices apply ultrasonic energy to the fluid, thereby processing it.

The operating devices may require maintenance over time. This requires the provision of one or more access passage provided adjacent to the elongated passage though which a person can to gain access to the operating devices. Accordingly, in order to minimize number/space required for access passages, conventionally, the operating devices would be radially aligned along the axis of the elongated passage. This allowed the provision of a single access passage to gain access to the operating devices.

However, a problem exists with the above arrangement in that radially aligning the operating devices limits how closely they can be positioned together. That is, the ultrasonic components of the operating devices which drive the ultrasonic vibrations typically have a large axial foot print, whereas the applicator/operating member components of the operating devices which project into the passage to actually apply the ultrasonic energy have a smaller axial foot print. Consequently, the size of the ultrasonic components limits how closely applicator/operating member components can be positioned together. It has been found that processing performance is enhanced by positioning the applicator/operating member components in close axial proximity and, therefore, the above arrangement is unable to achieve optimum performance.

The claimed invention addresses the aforementioned problem(s) by positioning axially adjacent operating devices so that they are radially non parallel and radially non-

opposing. In this way, by radially offsetting adjacent operating devices, the ultrasonic components of adjacent operating devices are able to effectively overlap axially along the elongate passage. This is shown, in FIG. 3 of the application as filed. This construction allows the applicator/operating member components 14 of the operating devices 12 to be positioned in close axial proximity, as shown in FIG. 1, whilst minimizing the space required for access passages.

Turning to the cited prior art as presented in the outstanding Office Action, Boucher fails teach above features as claimed. For example, the Examiner refers to FIGS. 7 and 8 of Boucher in the present Office Action. FIG. 7 shows a longitudinal cut of processing chamber 30 (see column 8, line 66) and FIG. 8 shows a cross sectional view of processing chamber 30 taken on lines 8-8 (see column 9, lines 5-6). Boucher describes an arrangement in which several ultrasonic transducers 56, 57, 58 are permanently fastened to a flat thin metal plate 59. The metal plate is then secured to flange 60 into the top of processing chamber 30. Liquid can be introduced into the processing chamber 30 via sideway inlet 32, where it passes along the processing chamber 30 (i.e. towards the left in FIG. 7). The ultrasonic transducers 56, 57, 58 emit ultrasonic vibrations downwardly (see arrows in FIG. 7) at right angles to the direction of flow of liquid (see column 8, line 66 to column 9, line 15).

As will be understood, in the arrangement of Boucher (shown in FIGS. 7 and 8), the ultrasonic transducers 56, 57, 58 are axially spaced along the length (i.e. spaced longitudinally/axially) of the processing chamber 30. However, in contrast to the present invention, adjacent ultrasonic transducers 56, 57, 58 in Boucher **are not** radially non-parallel and radially non-opposing, as claimed, at least for the following reasons.

Firstly, it can be clearly seen in FIG. 8 of Boucher that the ultrasonic transducers are aligned radially, because the ultrasonic transducers adjacent to ultrasonic transducer 57 shown in FIG. 8 are not visible in the cross section. This can be contrasted with FIG 2 of the present application, which shows a similar cross-sectional view, with adjacent operating devices 12 being radially offset by angle D°.

Secondly, the arrangement disclosed in Boucher requires that the ultrasonic transducers 56, 57, 58 are all permanently fastened to the same flat thin metal coupling plate 59, which is subsequently attached to the top of processing chamber 30 (see column 8, lines 69-71). Consequently, adjacent the ultrasonic transducers 56, 57, 58 of Boucher cannot be radially non-parallel and radially non-opposing because they are all positioned on the same flat coupling plate 59.

Thirdly, the processing apparatus of Boucher is directed to enhancing ultraviolet sterilization using the application of ultrasonic energy to enhance turbulence and cavitation (see column 5, lines 6-35, for example). As such, the ultrasonic transducers of Boucher are merely directed to enhancing turbulence and cavitation around the ultraviolet tube 31. Boucher is, therefore, not concerned with minimizing the amount of space available for access passages, nor allowing the applicators/operator members to be positioned in close axial proximity. Indeed, not only does Boucher fail to identify these considerations, but they would not, in any event, be applicable to the particular construction employed by Boucher. In this connection, Boucher utilizes ultrasonic transducers which do not have applicators/operator members which directly contact the fluid within the processing chamber 30. Instead the ultrasonic transducers of Boucher simply radiate out ultrasonic waves into the processing chamber 30 through coupling plate 59 (see arrows in FIG. 7 and column 8, lines 72-74). Consequently, the problem of ensuring the applicators/operator members can be

positioned in close axial proximity addressed by the present invention is not relevant to Boucher, since Boucher does not have ultrasonic transducers with applicators/operator members.

In addition, the Examiner is directed to the amendment to claim 37 to emphasize that the angle referred to in the claim is the angle between axially adjacent operating devices. That is, as per claim 37, axially adjacent operating devices are relatively radially displaced relative to each other by an angle between 0° and 90°. (Basis for aforementioned amendment can be found, for example, at least at page 2, lines 32-33 of the application as filled.) In this regard, the Examiner refers to column 8, lines 67 of Boucher to alleged disclose the aforementioned claim feature. However, this section of Boucher merely states that the ultrasonic transducers emit ultrasonic waves at "*a right angle to the direction of the fluid stream.*" As such, with Boucher the ultrasonic devices are radially aligned along the processing chamber, with the ultrasonic devices being positioned at 90° to the direction of fluid flow. This is very different from the claimed invention, in which the operating devices are relatively radially displaced relative to each other along the elongate passage.

Accordingly, it is submitted that Boucher fails to provide any teaching or suggestion of the claimed invention, as recited in independent claims 36 and 66 and associated dependent claims.

Turning to Kelly, this reference also fails to teach the above features of the claimed invention. In this connection, Kelly concerns an ultrasound/UV reaction chamber in which ultrasound is used to form vapor-gas bubbles in the liquid to be treated, and subsequently UV radiation is applied to the bubbles to form powerful oxidants. The general construction involves an untreated water inlet valve (4, 5 and 6 in Fig. 1) which jets untreated water into

the reaction chamber in cylindrical casing 1. An ultrasound vibrator (9, 8 and 7 in Fig. 1) is also attached to the cylindrical casing and is used to generate a powerful acoustic field in the water (see page 9, lines 19-32).

The Examiner has specifically identified FIGS. 6 and 7 of Kelly as disclosing the features of the present invention. However, FIGS. 6 and Figure 7 show alternative embodiments of two different disinfection preparation units which may be used in conjunction with the main reaction chambers described in the bulk of Kelly. FIG. 6 shows a sectional view of an input channel of a first example disinfection preparation unit, whereas FIG. 7 shows a sectional view of a second example, in-tank or in-pipe or manifold, disinfection preparation unit (see page 9, lines 12-17). In both cases, the disinfection preparation units are separate from the main cavitation units.

In the embodiment shown in FIG. 6, four ultrasonic cavitators 15 are provided in the input channel 13 (see page 18, lines 5-6). Two of the ultrasonic cavitators 15 are radially opposing the other two ultrasonic cavitators 15, with all four ultrasonic cavitators 15 being provided at the same axial position along input channel 13.

In the embodiment shown in FIG. 7, three ultrasonic cavitators 16 are provided in the input pipe 17 (see page 18, lines 9-10). In this case, the ultrasonic cavitators 16 are equiangularly spaced from one another around the radius of the pipe, with all three ultrasonic cavitators 16 being provided at the same axial position along input pipe 17.

Accordingly, the simple arrangement shown in either FIG. 6 or FIG. 7 of Kelly is clearly different from the configuration employed in the claimed invention. In particular, the ultrasonic cavitators of Kelly are not disposed axially spaced along the pipe, as in the claimed invention. In this respect, in both FIGS. 6 and 7 of Kelly the ultrasonic cavitators are provided at the same axial position along input channel/pipe. This is clearly evidenced in

each embodiment by the cross sections taken in FIGS. 6 and 7 showing all of the respective ultrasonic cavitators bisecting their input channel/pipes at the same axial position (i.e. the axial position at which the cross section is taken). Furthermore, Kelly makes no teaching or suggestion that the ultrasonic cavitators of FIGS. 6 and 7 could be axially spaced. Moreover, Kelly also fails to identify the problem of providing space for access passages, whilst maintaining the ultrasonic captivator in close axial proximity, to which the present invention is directed. Therefore, it is submitted that Kelly fails to provide any teaching or suggestion of the claimed invention, as claimed in claim 36, 57, and 64. It is therefore submitted that the claimed invention is novel and non-obvious over Kelly.

For anticipation under 35 U.S.C. § 102, the reference must teach every aspect of the claimed invention either explicitly or impliedly. Any feature not directly taught must be inherently present (M.P.E.P. 706.02). Since each and every element, as set forth in the claims are not found either expressly or inherently described as required by the M.P.E.P., Boucher and Kelly cannot be said to anticipate the invention as claimed. Hence, withdrawal of the rejection is respectfully requested.

Each of the dependent claims depend from one of independent claims 36, 57, 64, or 66 and are patentable over the cited prior art for at least the same reasons as set forth above with respect to claims 36, 57, 64, and 66. In addition, each of the dependent claims also recites combinations that are separately patentable.

Claims 38, 39 and 44 were rejected under 35 U.S.C. §103(a) as being unpatentable over Boucher as applied above in claims 36 and 37. However, each of the aforementioned dependent claims ultimately rely upon independent claim 36 which recites a specific combination of features that distinguishes the invention from Boucher in different ways as

outlined above. At the very least, the applied reference fails to disclose or suggest any of these exemplary features recited in independent claim 36. Since each of the dependent claims 38, 39 and 44 depend from independent claim 36, claims 38, 39 and 44 are patentable over the cited prior art for at least the same reasons as set forth above with respect to claim 36. In addition, each of the dependent claims also recites combinations that are separately patentable.

In view of the foregoing remarks, this claimed invention, as amended, is not rendered obvious in view of the prior art references cited against this application. Applicant therefore requests the entry of this response, the Examiner's reconsideration and reexamination of the application, and the timely allowance of the pending claims.

In discussing the specification, claims, and drawings in this response, it is to be understood that Applicant in no way intends to limit the scope of the claims to any exemplary embodiments described in the specification and/or shown in the drawings. Rather, Applicant is entitled to have the claims interpreted broadly, to the maximum extent permitted by statute, regulation, and applicable case law.

Except for issue fees payable under 37 C.F.R. § 1.18, the Commissioner is hereby authorized by this paper to charge any additional fees during the entire pendency of this application including fees due under 37 C.F.R. §§ 1.16 and 1.17 which may be required, including any required extension of time fees, or credit any overpayment to Deposit Account No. 19-2380. This paragraph is intended to be a **CONSTRUCTIVE PETITION FOR EXTENSION OF TIME** in accordance with 37 C.F.R. § 1.136(a)(3).

Should the Examiner believe that a telephone conference would expedite issuance of the application, the Examiner is respectfully invited to telephone the undersigned patent agent at (202) 585-8316.

Respectfully submitted,

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